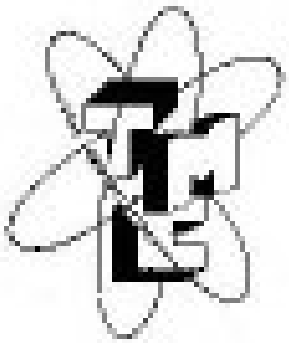
INSTRUCTION BOOK

for

ANTENNA TUNING UNIT

MODEL TAC



THE TECHNICAL MATERIEL CORPORATION
Mamaroneck, New York

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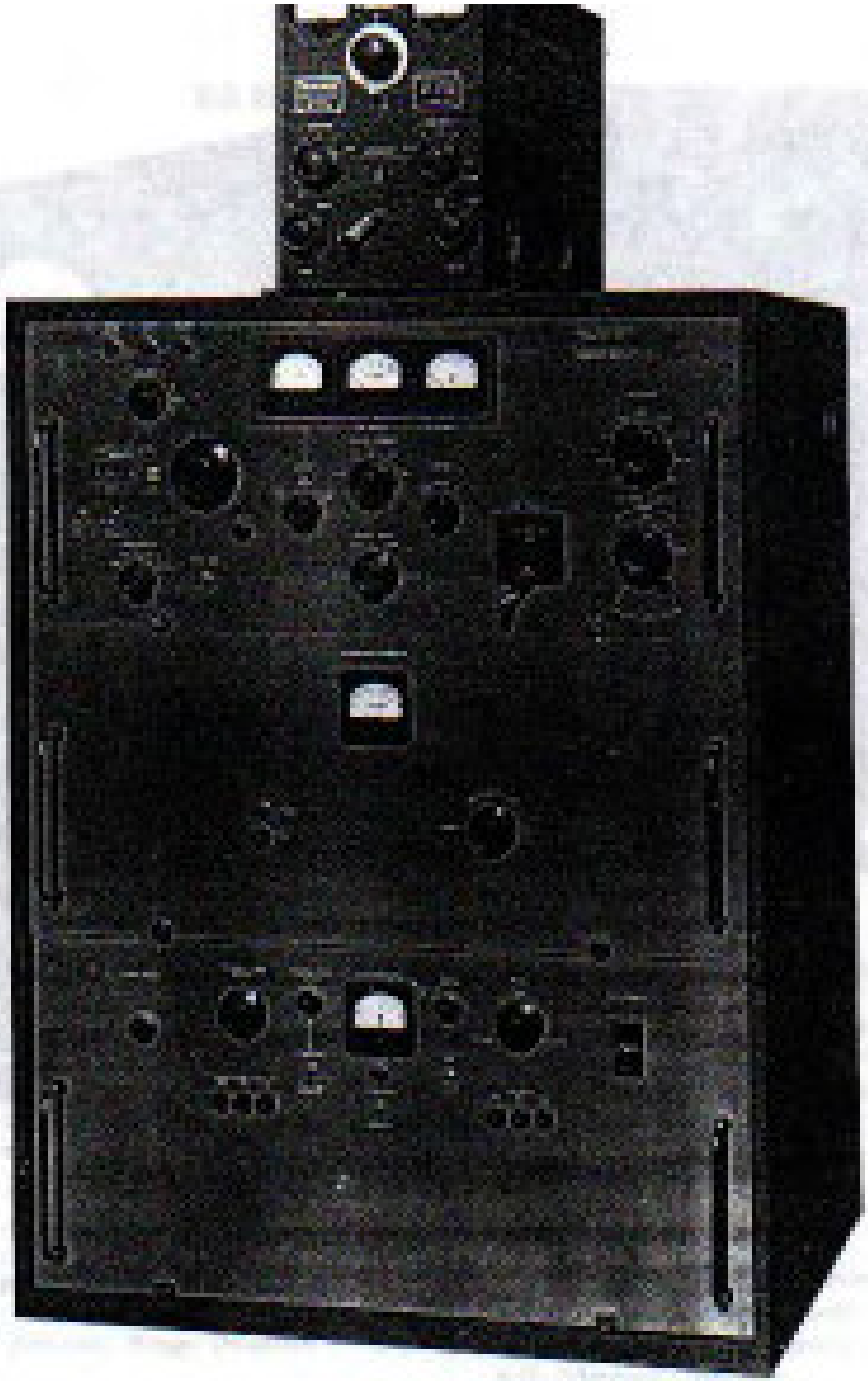

SECTION I
GENERAL DESCRIPTION

1. PURPOSE AND BASIC PRINCIPLES.

The Antenna Tuning Unit, Model TAG-1 has been designed to couple the output of the GPT-750 transmitter, or any transmitter with a nominal output impedance of 70 ohms, to balanced or unbalanced loads from 50 to 1200 ohms. The unit covers the frequency range of 2 to 30 mcs. with very little insertion loss and will, in addition, cover the range of 30 to 50 mcs. at slightly lower efficiencies. Provisions are also included in the unit which will permit operation down to 1.7 mcs. with a balanced load and 1.5 mcs. with an unbalanced load. These loads are taken to mono antennas or transmission lines.

The unit consists of a tapped inductance tuned by a split stator capacitor. Portions of the inductance are shorted out as the frequency of operation increases. A variable contact on the inductance serves to vary the ratio of inductance in the tank circuit to the inductance in the load circuit hence matching the load to the transmitter.

2. DESCRIPTION OF THE UNIT

The entire unit is housed in a steel case with a removable cover. However, the unit is so designed that all connections may be made without removing the cover. The unit is 9½ in. wide by 14½ in. high by 22 in. long and weighs approximately 35 pounds.

Mounting channels are provided with holes appropriately spaced to match transmitter rails. All controls, and meters for monitoring the antenna current are located on the front panel. Insulated terminal posts which are easily reached through apertures on the rear of the cover permit connections to balanced or unbalanced loads. Particular care has been taken to insulate the unit from the high voltages which may occur in such a device.

3. REFERENCE DATA.

a. FREQUENCY RANGE.

2 to 30 mcs. in seven bands, balanced/unbalanced loads.

1.7 to 2 mcs. balanced load using additional vacuum capacitor furnished.

1.5 to 2 mcs. unbalanced load using shorting bar furnished.

b. INPUT IMPEDANCE.

Nominally 70 ohms.

c. OUTPUT IMPEDANCE.

Continuously adjustable 50 to 1200 ohms.

d. INPUT CONNECTIONS.

UHF series UG-306/U receptacle. (Same as SO-239 but with Teflon insert.)

e. OUTPUT CONNECTIONS.

Insulated stand-offs at rear of unit.

f. EFFICIENCY.

Better than 80% in the range 2 to 18 mcs. Slightly lower efficiency in the range 18 to 30 mcs.

g. POWER.

Designed for 1000 watts continuous carrier.

h. FRONT PANEL CONTROLS.

COUPLING switch
BAND switch
BAL/UNBAL LOAD switch
GND/UNGND ROTOR switch
LOAD ADJUST inductor
TUNING dial
ANTENNA CURRENT thermocouple meter 0 to 5 amp.

i. COMPONENTS AND CONSTRUCTION.

All parts of the unit are manufactured in accordance with JAN/MIL specifications wherever practicable.

SECTION II
THEORY OF OPERATION

1. THEORY OF OPERATION.

In coupling a transmitter to a transmission line or antenna, the basic problem is one of impedance matching. The coupling device introduced between the transmitter and the load should be capable of transforming the impedance of the load, so that the transmitter output tube is working into the proper resistance. The tube is working into the proper resistance when the final tank circuit is tuned to resonance, and the loading is such that the tube is drawing rated plate current. The optimum value of load resistance is, therefore, reached

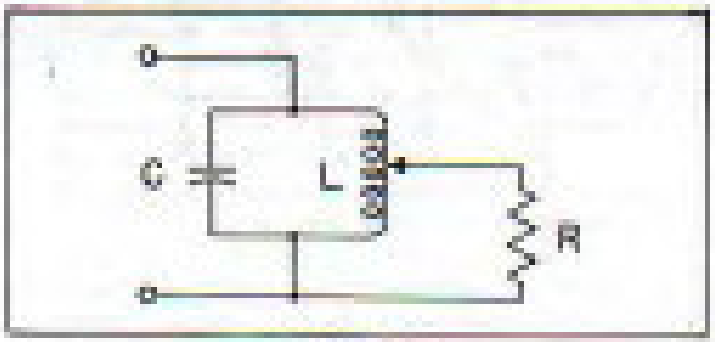

Figure 2-1

where the coupling is adjusted to bring the plate current to the normal operating value.

It is the property of a tuned parallel circuit that a resistive load tapped across a portion of the circuit is equivalent to a higher value of resistance tapped across the whole circuit.

Since the unloaded resonant impedance of the L/C combination is considerably higher than the load R, it is possible to match a range of impedances in this manner.

When the transmission line or antenna possesses a reactive component, in addition to the resistive component, the reactive components being either inductive or capacitive, they will appear as a series combination as shown in Figure 3-2.

This series combination may be transformed by analytical methods to it's equivalent parallel combination as in Figure 3-3.

The reactive portion of the load is reflected into the tuned circuit along with the resistive portion. If the load has an equivalent parallel combination of an inductive reactance, it will detune the tank circuit off resonance, and the capacitance of C must be increased to bring the tank back to resonance.

If the load has an equivalent capacitive reactance, C must be decreased to bring the tank back to resonance. Therefore, it is evident that the reactance of the load is balanced out by the tuning condenser in bringing the system to true resonance. When this resonant has been obtained, the load R is transformed to a higher value by the action of the tuned resonant circuit.

Figure 3-4 is a simplified schematic diagram of the Antenna Tuning Unit and a transmitter final. The transmitter final is link coupled to the unit input through a short length of RG-11/U coaxial cable. The coupling coil in the unit electro-magnetically couples to the tank circuit, composed of L1, L2, C1 and C2, which are tuned to the resonant frequency. The load is connected to the tank through a set of wheels which ride on the inside edges of L1 and L2. These wheels are on a common shaft and are positioned by the LOAD ADJUST control. Since the coils L1 and L2 are oppositely wound, the wheels move in or out from the ground point symetrically. It is these wheels which tap the coils properly for the desired impedance transformation. Now that this is a balanced system providing properly phased currents to a balanced load. In the event of an unbalanced load, one half of the system is used.

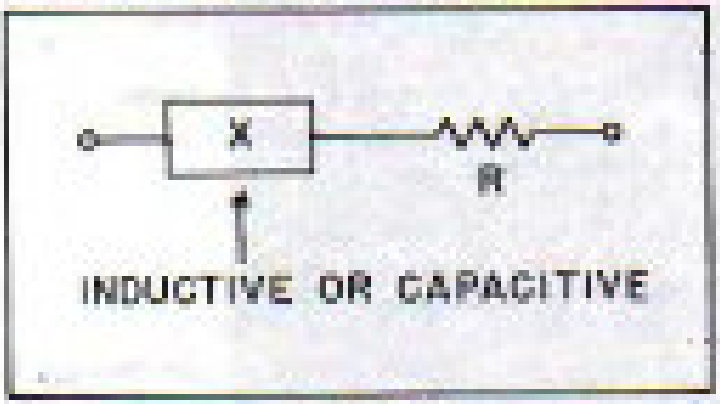

Figure 3-2

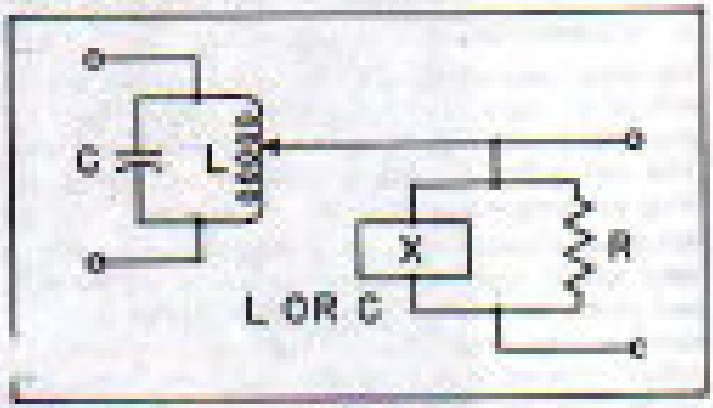

Figure 3-3

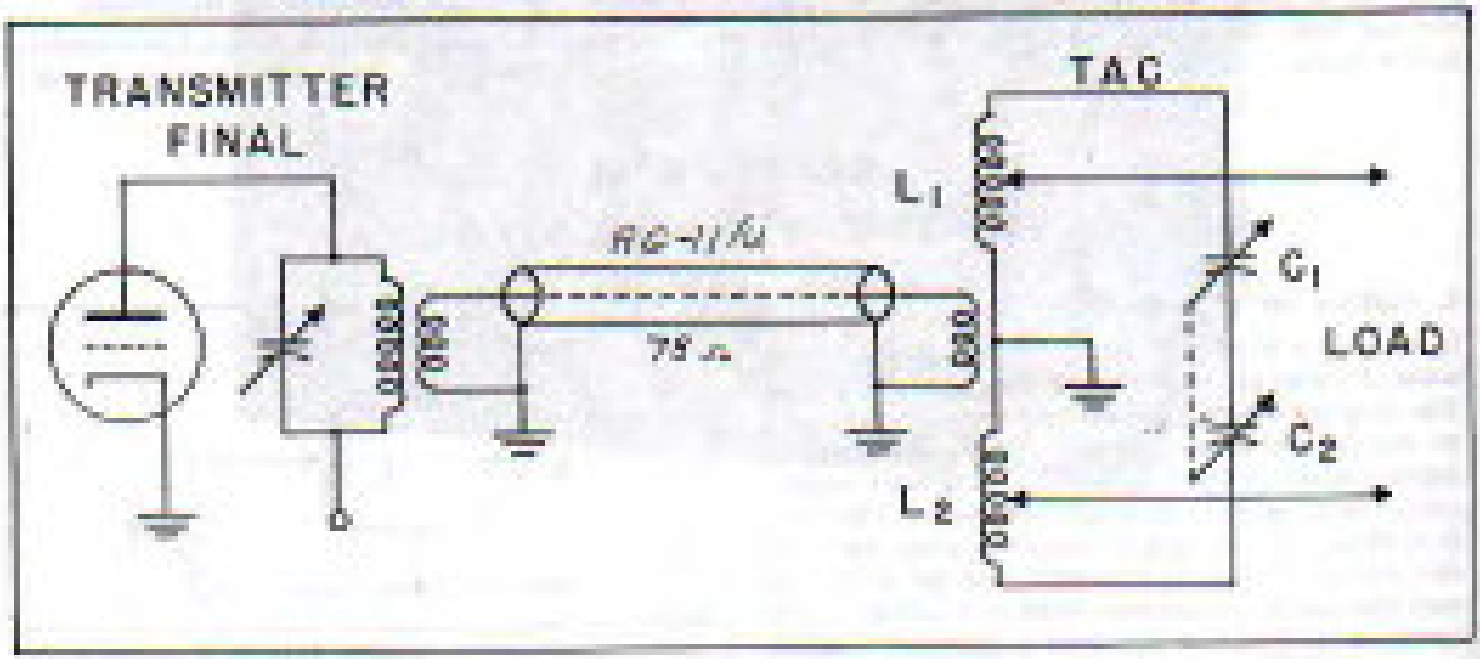

Figure 3-4

SECTION III
INSTALLATION AND OPERATION

1. INSTALLATION.

a. UNPACKING.

The Antenna Tuning Unit is designed for ease of installation and minimum effort in operation. The unit is packed, and preserved when required, in it's individual container. The equipment should be carefully unpacked and a close visual inspection made to ascertain any physical damage due to rough handling during shipment.

A UHF type plug PL-259A has been provided as a spare item, and is packed in a bag attached to the front panel.

b. MOUNTING.

The Antenna Tuning Unit is fastened securely on the top of a transmitter by means of four wing nuts. A short length of RG-11/U coaxial cable serves to connect the output of the transmitter to the input of the unit. The input terminal has been placed on the rear left corner of the unit so that the connecting cable does not interfere with transmitter operation. The input jack is a UG-306/U connector with Teflon insulation capable of withstanding high voltage surges.

2. ELECTRICAL CONNECTIONS.

After the unit has been installed on the transmitter, attach the load. The load terminal connections on the rear of the unit are shown in Figure 3-1. It is not necessary to remove the cover to attach the load. Ample holes in the rear of the cover give easy access to the connectors. Note the difference between BALANCED and UNBALANCED load terminals as indicated by arrows. When working into an unbalanced load, CONNECT NOTHING TO THE LEFT HAND MAIN TERMINAL.

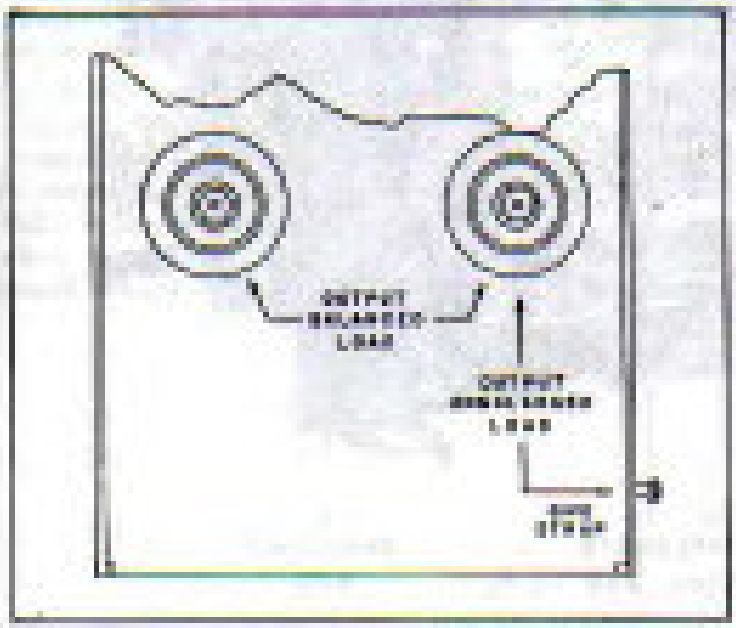

Figure 3-1

3. OPERATION AND CONTROLS.

All controls are identified by front panel markings for ease of identification. Figure 1-1 clearly shows all controls necessary for operation of the unit.

a. CONTROL FUNCTIONS.

The COUPLING switch allows for selection of the number of turns in the coupling coil. There are 8 positions from MAX to MIN. The proper setting of the COUPLING switch is a function of frequency and may be found in the tuning charts.

In general, a low transmitter plate final current reading indicates insufficient coupling, and the COUPLING switch should be rotated toward MAX in steps of one until plate current has reached it's normal value when the transmitter is tuned to resonance. Conversely, a plate current meter reading which is above normal is an indication of over-coupling, and the COUPLING switch should be rotated toward MIN until the proper plate current is observed when the transmitter is tuned to resonance.

The BAND SWITCH allows for the selection of tank inductance, so that the frequency range is covered by the tuning capacitor. There are seven positions with LO indicating the lowest frequency and HI indicating the highest frequency. Proper positioning of this switch is a function of frequency and may be obtained in the tuning charts.

The TUNING control is a calibrated control which serves to vary the tank capacity of the unit. It varies to resonance the inductance selected by the BAND switch. Approximate settings for this dial may be obtained by referring to the tuning charts.

The LOAD ADJUST control serves to tap the tank circuit at the proper point for optimum impedance matching. It's associated counter gives the relative position of the wheels with respect to the ground end of the circuit. Approximate settings for the various loads may be found in the tuning charts.

The LOAD switch serves to employ either the total tank for balanced loads or half the tank for unbalanced loads. Set the switch to BAL for balanced loads and UNBAL for unbalanced loads.

The ROTOR switch serves to ground or ungound the stator of the tuning capacitor. In general, set to GND for unbalanced loads and UNGND for balanced loads. However, it may be possible that at the higher frequencies, 24 to 30 mcs., better performance may be obtained if the ROTOR switch is set to UNGND. This is, in effect, placing both halves of the tuning capacitor in series across that portion of the tank coil which is being used. This is advantageous at the higher frequencies since the maximum minimum has been halved; hence, the tank inductance may be increased, resulting in a better L/C ratio.

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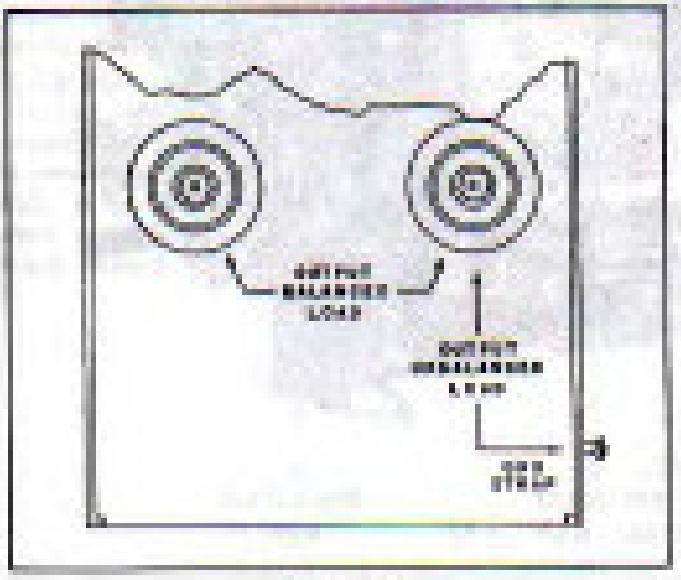

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The LOAD switch serves to employ either the total coil for balanced loads or half the coil for unbalanced loads. Set the switch to BAL for balanced loads and UNBAL for unbalanced loads.

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The ANTENNA CURRENT is measured by two external thermocouple ammeters, each being in series with the output load connections. As the names indicate, both meters are used for balanced loads, each meter indicating the current in it's leg of the load. In a truly balanced load, magnitude being equal, both meters will indicate identical currents. This will seldom happen as a truly balanced load is rarely obtained. As the single arrow indicates, only the left hand meter is used for unbalanced loads. Therefore, for unbalanced loads disregard any deflection of the right hand meter.

It should be noted that these meters are to serve only as indicating devices. Their accuracy is acceptable at the lower frequencies, but little reliance is to be placed on their indications as a measure of absolute load at the higher frequencies. They are not, in any case, a quantitative indication of output.

6. TUNING PROCEDURE.

CAUTION

BEFORE PUTTING FULL POWER ON THE TRANSMITTER, CHECK THAT THE FOLLOWING HAS BEEN DONE CORRECTLY.

a. PROPER TRANSMITTER TUNING ACCORDING TO THE TRANSMITTER TUNING CHARTS.

b. PROPER ANTENNA TUNING UNIT CONTROL SETTINGS AS OBTAINED FROM THE UNIT TUNING CHARTS.

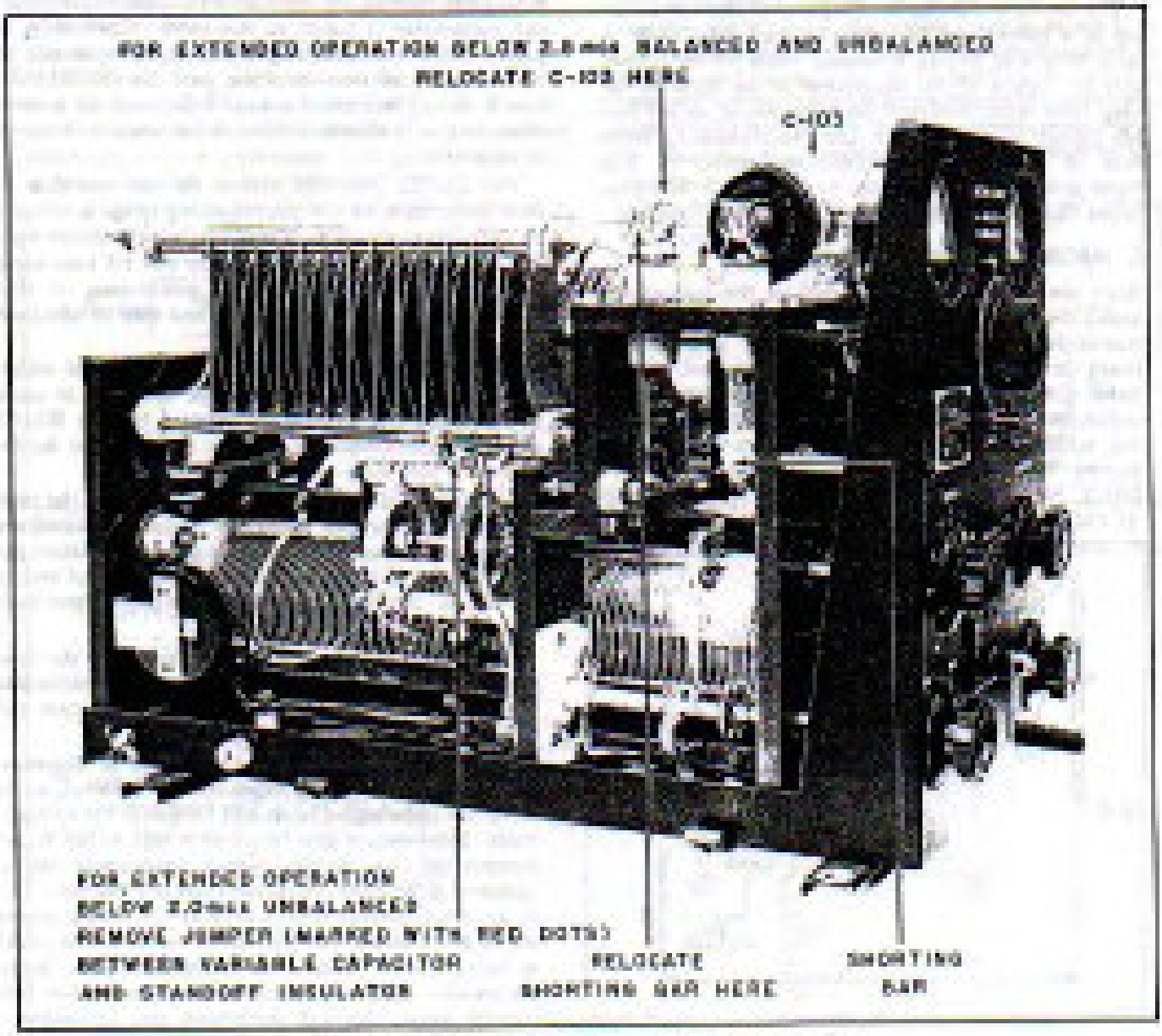


Figure 3-2. Extended Frequency Range Operation

In any operation of the Antenna Tuning Unit, the frequency of operation and nature of the load are known.

For a balanced load, set
LOAD switch to BAL
ROTOR switch to UNGND

For an unbalanced load, set
LOAD switch to UNBAL
ROTOR switch to GND
(except as noted in 5a.)

The tuning charts contain information for the approximate settings of the BAND, TUNING, LOAD ADJUST and COUPLING controls.

The charts are set up in 1000 kc. steps from 2000 to 30,000 kcs. and for loads of 70, 300, 600 and 1200 ohms.

Any variation from chart frequency and load will require an interpolation of the tables for the desired frequency and load. To achieve this, set controls to the chart frequency nearest to the desired frequency. Then adjust the TUNING and LOAD ADJUST controls for optimum output.

5. EXAMPLE.

To set up the Antenna Tuning Unit at a frequency of 5000 kcs. to work into a balanced transmission line of a nominal 600 ohm impedance.

Connect transmission line to BALANCED terminals on rear of unit.

Set LOAD switch to BAL.
Set ROTOR switch to UNGND.

Refer to tuning charts, Figure 3-11, for approximate control settings for a frequency of 5000 kcs. and a balanced load of 600 ohms.

Set TUNING control to 34
Set COUPLING switch to 2
Set BAND switch to 3
Set LOAD ADJUST to 147

When these settings have been made, tune both the transmitter and the Antenna Tuning Unit to optimum output on LOW POWER.

Switch transmitter to HIGH POWER. Readjust TUNING and LOAD ADJUST controls as required. If the transmitter plate current is above normal when tuned to resonance, rotate the COUPLING switch toward MIN. If the transmitter plate current is below normal when tuned to resonance, rotate the COUPLING switch toward MAX. Remember, if the load is not truly balanced the ANTENNA CURRENT meters will not read identically.

CAUTION

Most transmitters have output coupling networks which can be varied. An excessive deviation from optimum coupling will result in large reactive currents in the transmitter output-TAC input circuit.

If one does not already exist, it is recommended that an R.F. Ammeter be installed at the transmitter output terminals.

An excessive transmitter R.F. output current results in increased losses in the coupling networks and lower transmission efficiency. If this condition appears to exist, adjustments should be made to the transmitter OUTPUT COUPLING network and the TAC COUPLING, TUNING and LOAD ADJUST controls to reduce the TRANSMITTER OUTPUT CURRENT to a minimum while maintaining proper transmitter loading.

6. EXTENDED FREQUENCY RANGE OPERATION.

The Antenna Tuning Unit is basically designed for a frequency range of 2 to 30 mcs. but will operate up to 50 mcs. Keep transmitter on LOW POWER when tuning above 18 mcs. The unit will tune and put out appreciable power at these higher frequencies, but variation of the control settings may be considerable. A "horn gap", set to ¼ in. spacing, on the rear of the unit, is provided to prevent damage to the unit in the event of improper adjustments.

For operation below 2.5 mcs. with both balanced and unbalanced loads, remove vacuum capacitor C103 from it's storage clips in the upper front portion of the unit. Place it in shunt operating clips which are connected to the stator plates of the tuning condenser C100. (See Figure 3-2.) This lowers the operating range of the unit to below 2 mcs.

For further reduction of the operating range, in the unbalanced condition only, replace the vacuum capacitor C103 with the metal shorting bar E156, and disconnect the jumper (marked with red dots) between the tuning capacitor C100 and the stand-off insulator on the upper left hand portion of the unit. (See Figure 3-2.)

SECTION IV
MAINTENANCE

1. MAINTENANCE INSTRUCTIONS.

a. TOOLS FURNISHED.

1 TP-101 Punch, drive pin, to remove or replace roll pins.

1 WR-100-3 Wrench, Allen, for #5 and #6 set screws.

1 WR-100-5 Wrench, Allen, for #10 and #13 set screws.

1 WR-100-10 Wrench, Allen, for #8 set screws.

b. GENERAL.

Keep interior of the unit thoroughly clean and dust free.

Material Required.

Sandpaper #600.

Dry brush or lint free cloth.

Carbon Tetrachloride for electrical connection.

Dry Cleaning Solvent for other parts.

Compressed air may be used to remove dust from inaccessible areas.

c. PREVENTIVE.

Materials Required.

Lubricating Compound, Silicone.

Insulating Compound MIL-I-17301A, Type PR.

Monthly.

Lubricate all sliding contacts connected with the wheel assembly (LOAD ADJUST) with Lubricating Compound, Silicone.

Check and tighten hardware and set screws where necessary. (Tighten nuts and screws carefully. Fittings tightened beyond the pressure for which they are intended will be damaged or broken.)

Quarterly.

Check switches for dirt, corrosion or loose contacts.

Check variable condenser and coils for dirt, corrosion, bent plates or damaged turns.

Abnormal Conditions.

In the event of excessive power input or of switching the unit with POWER ON, an arc-over may occur, usually in the ROTOR or LOAD switch or both. Should this happen, clean the affected area, and spray all carbon deposits, coat area lightly with Insulating Compound.

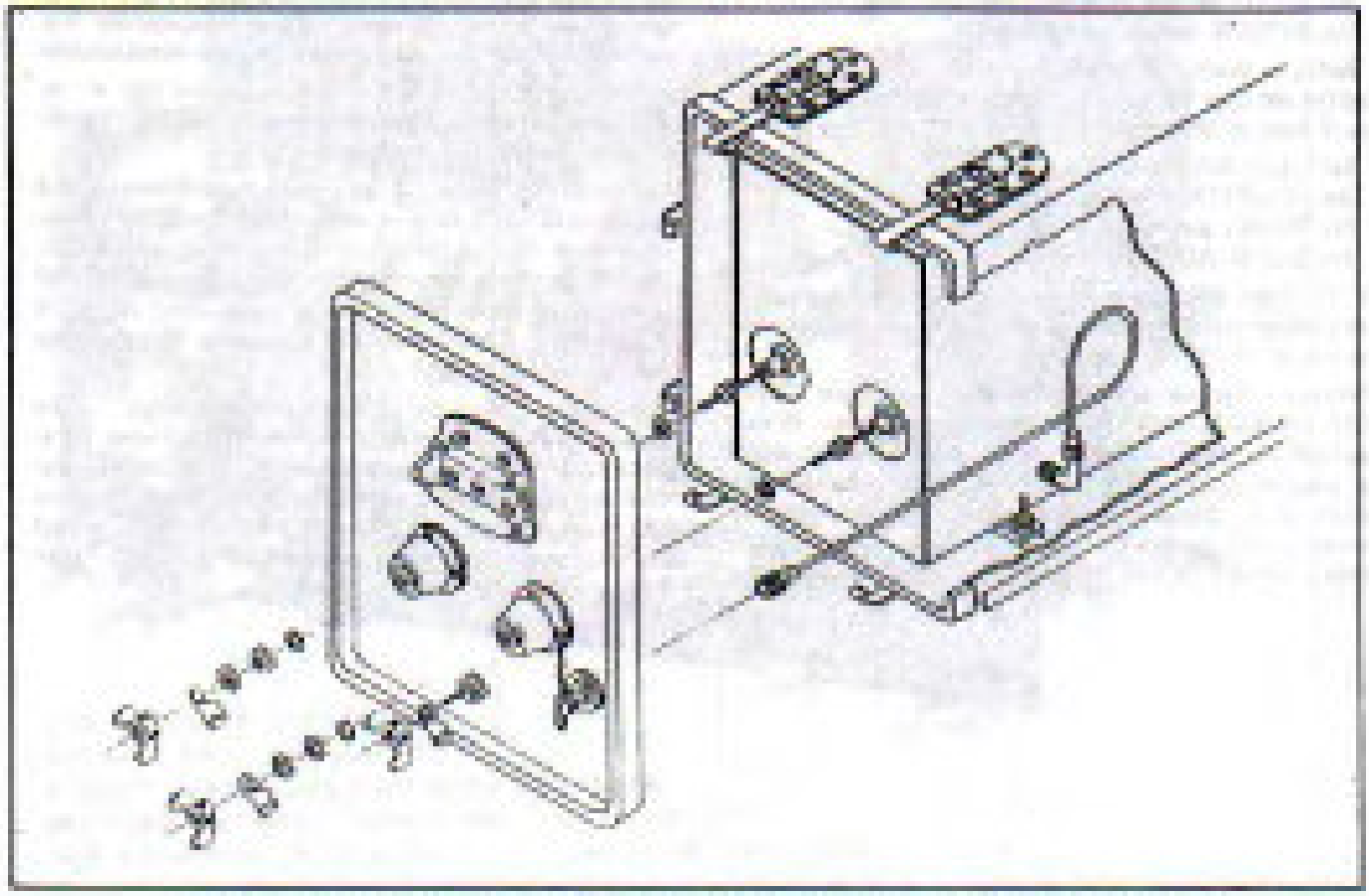
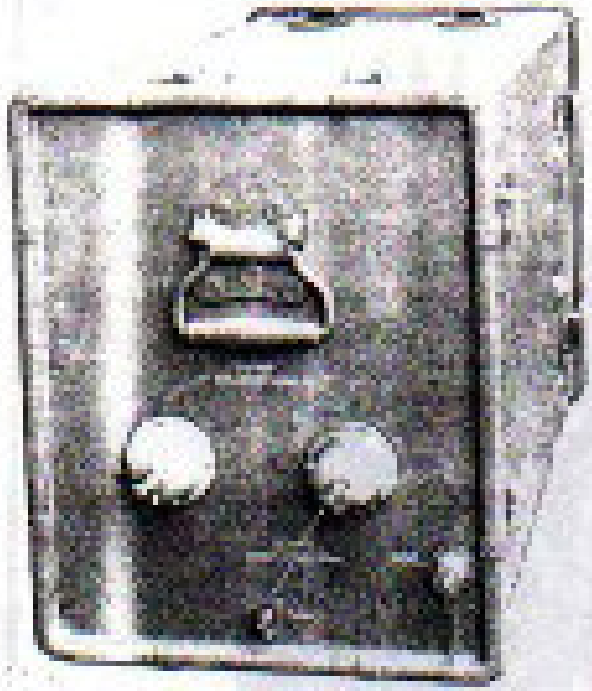
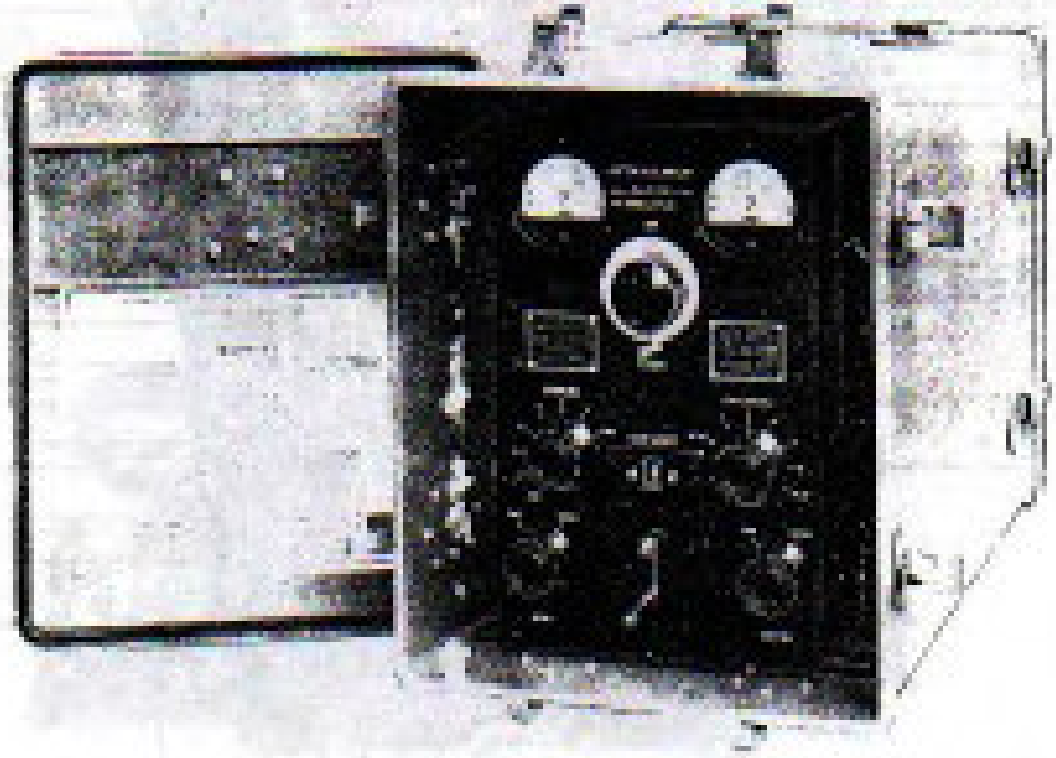


Figure 4-1. Front and Rear Views, Model TAC-1 with Protective case, Model CTAC



As illustrated, the Antenna Tuning Unit can be furnished with and shipped in a protective case, Model CTAC. The case is constructed of fiberglass reinforced plastic, and is both waterproof and weatherproof.



The unit will mount on the transmitter and operate either with or without this protective case. Special studs, which mount the unit in the case, are furnished for mounting the case to the transmitter in the event that the transmitter mounting studs are too short.

Figure 4-2. Rear View, Input and Output Connections Between Unit and Case

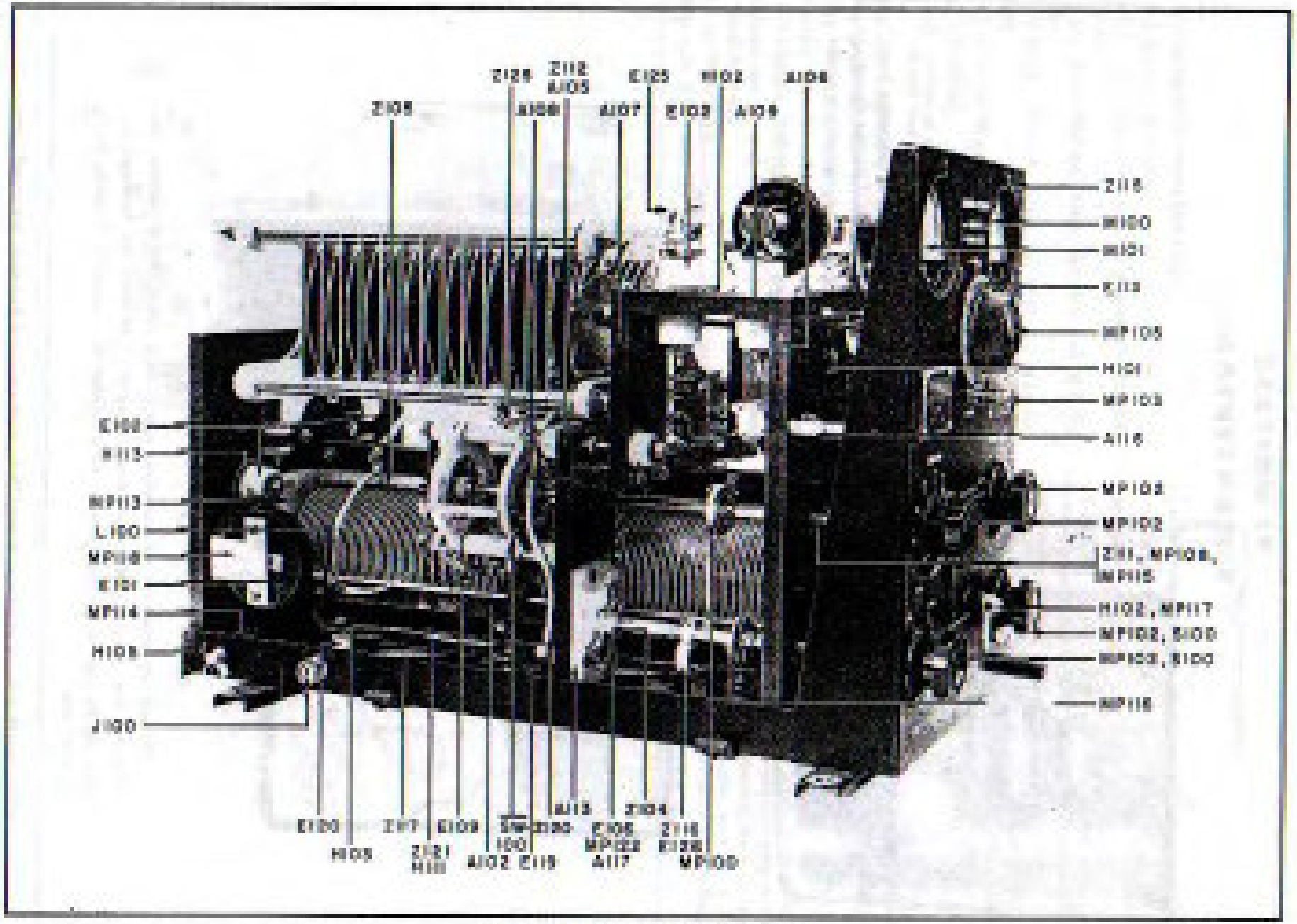


Figure 4-2. Front and Left Side View

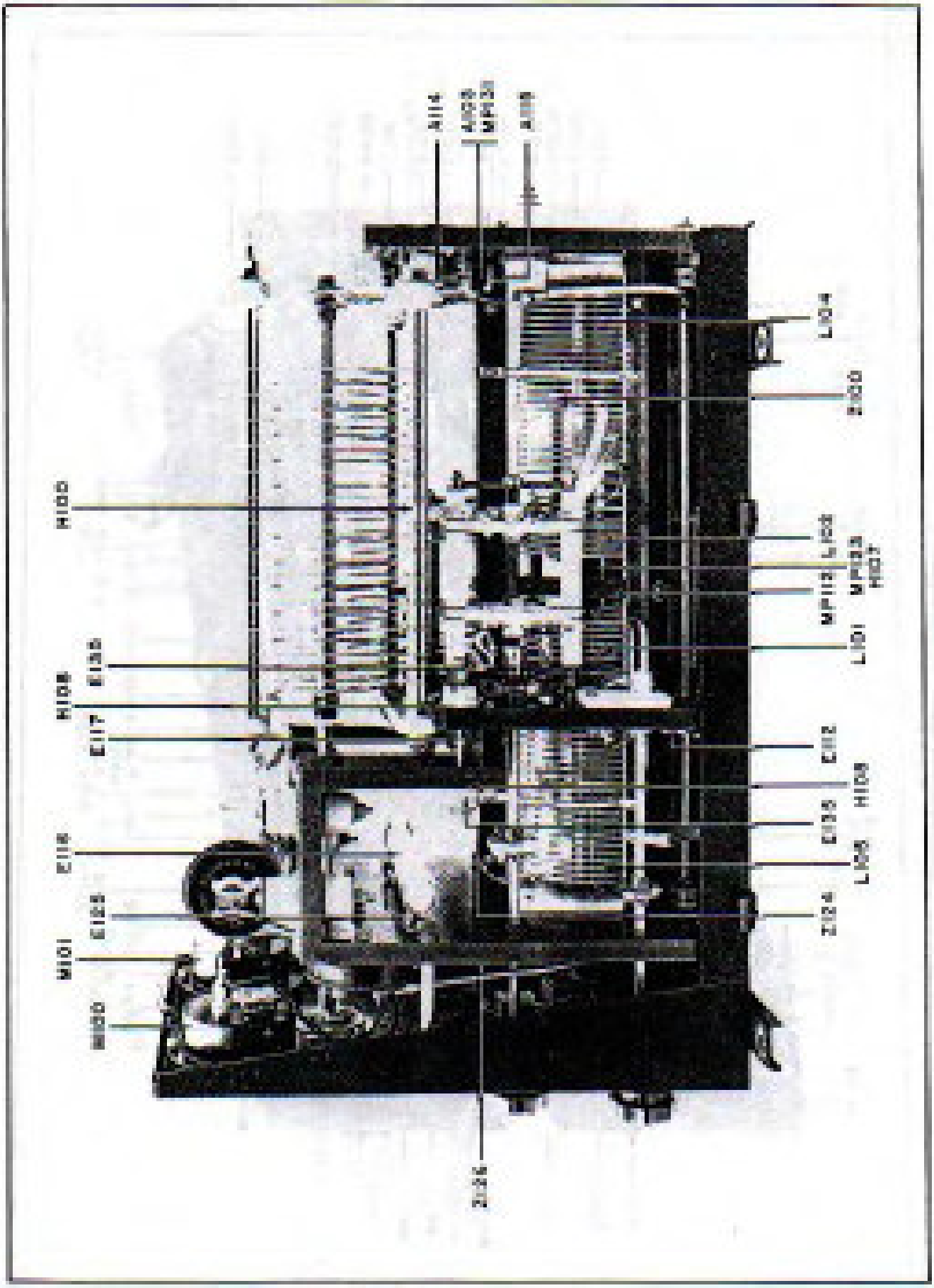


Figure 4-4. Right Side View

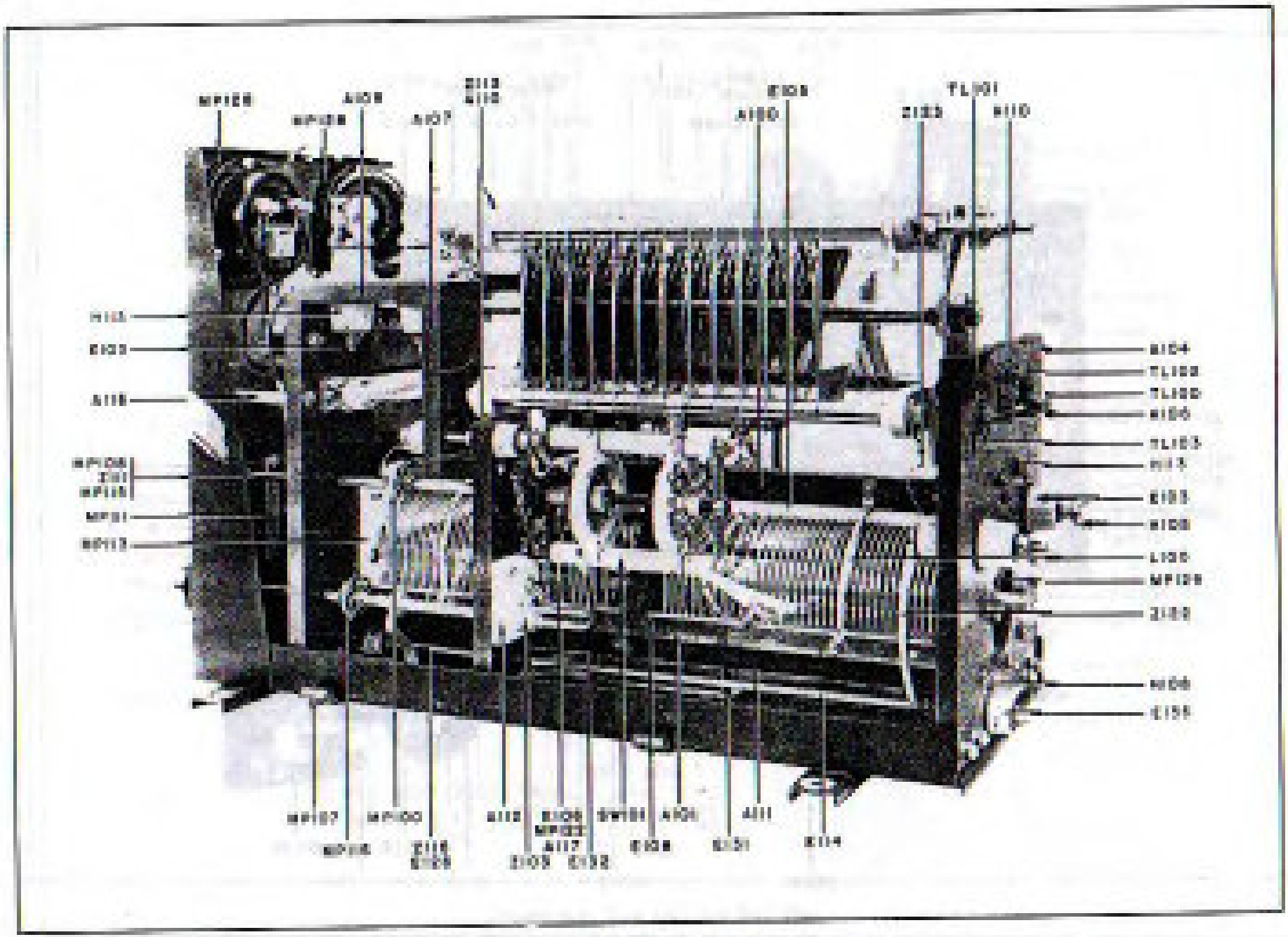


Figure 4-2. Right Side and Rear View

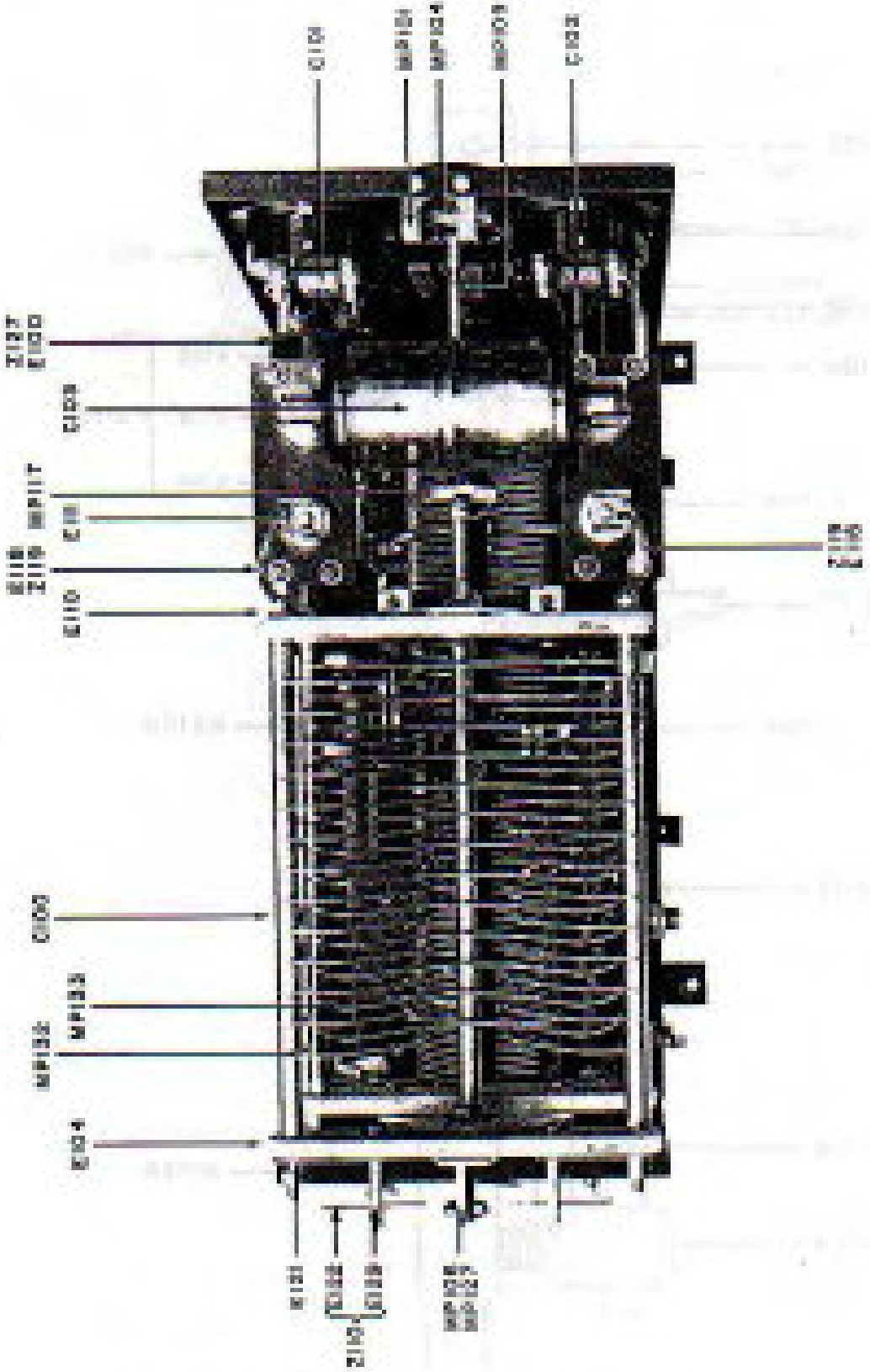


Figure 4-4. Top View

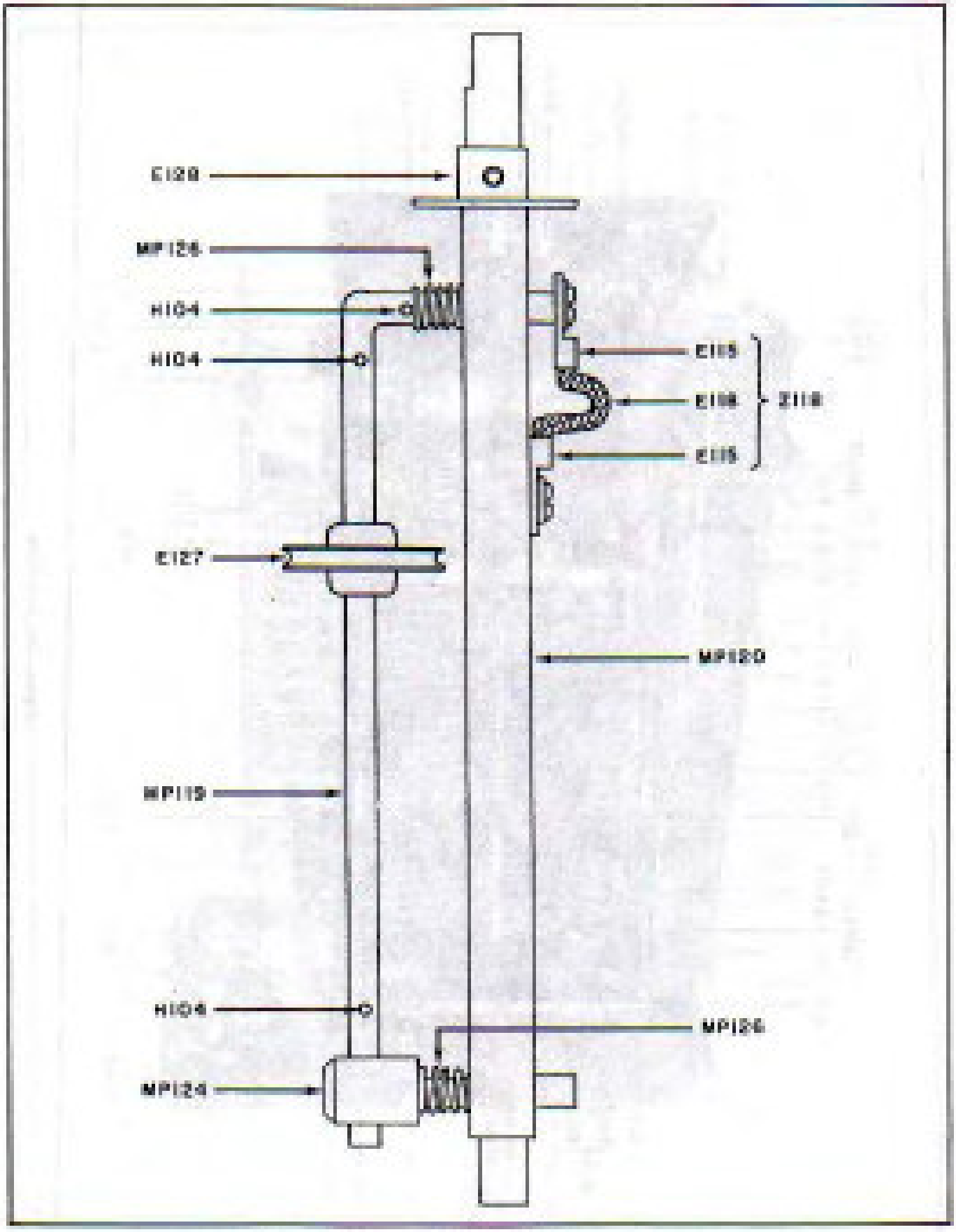


Figure 4-7. Control Wheel and Shaft Assembly 2301

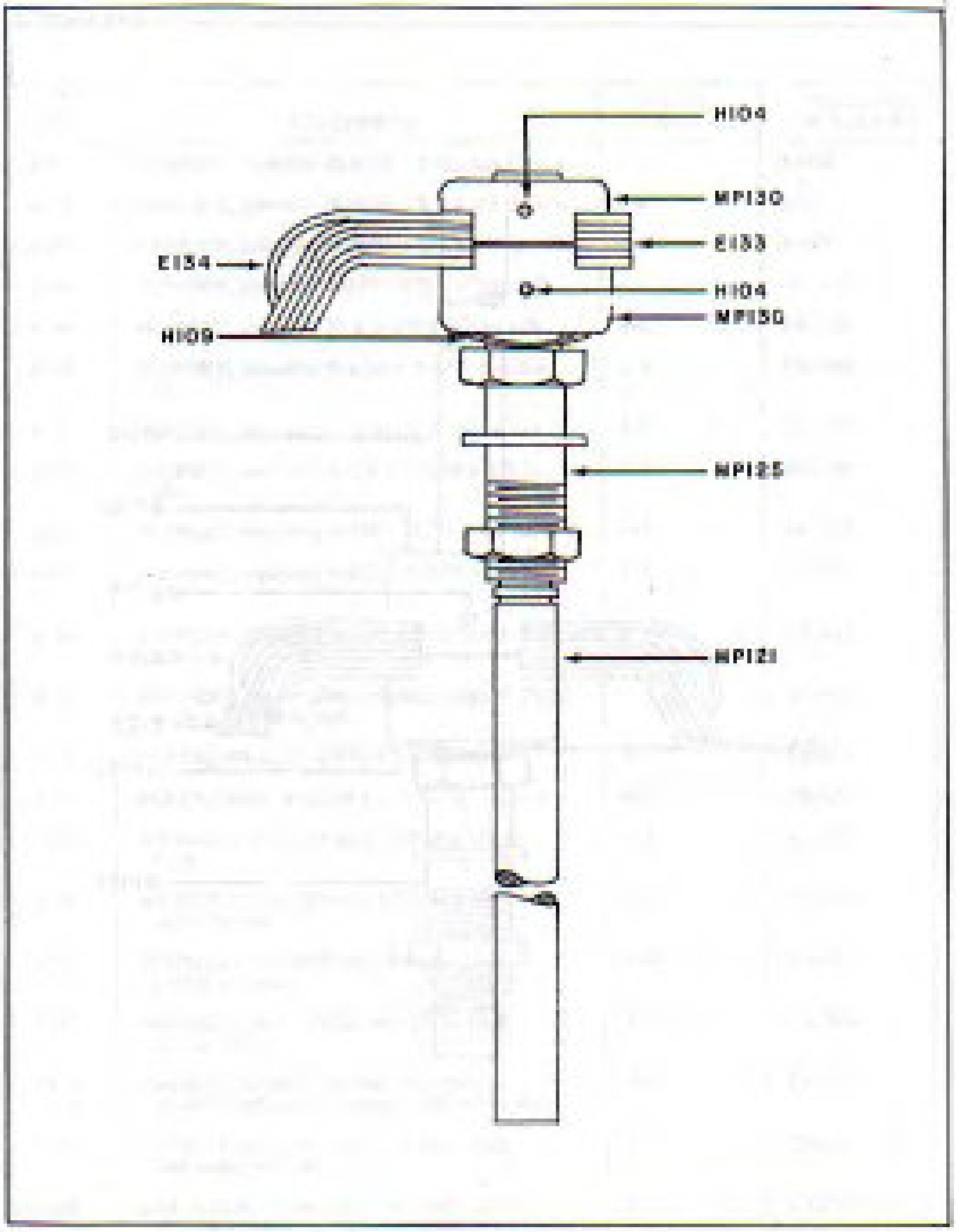


Figure 4-8. Single Level Switch Assembly 2180

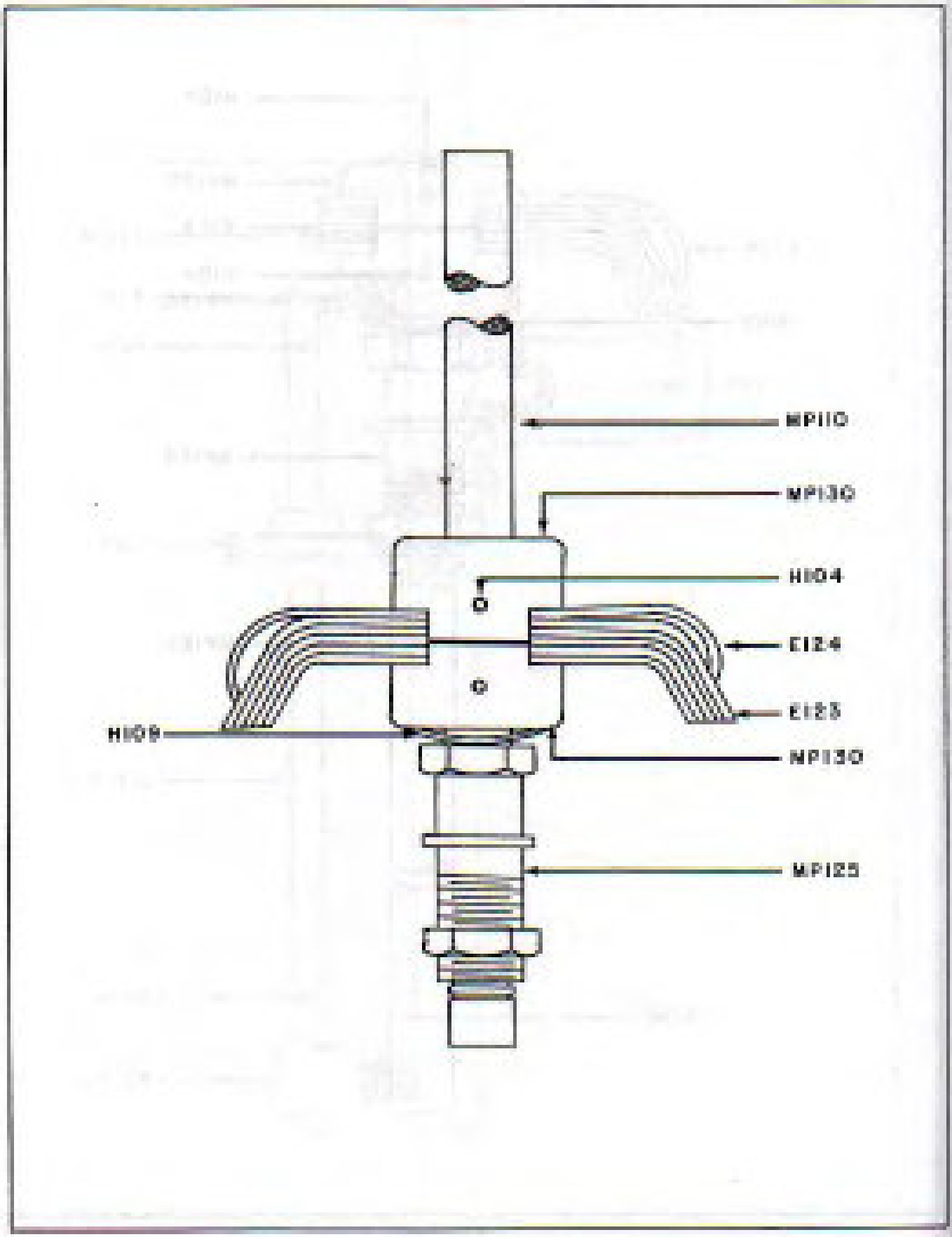


Figure 4-9. Double Leaf Switch Assembly 2384

SYM.	DESCRIPTION	FIGURE NO.	TMC DWG OR PART NO.
A100	SUPPORT, phenolic: 55-5/16 x 3/4 x 3/4 in. o/a.	4-5	A-710
A101	SUPPORT, phenolic: 55-5/16 x 3/4 x 3/4 in. o/a.	4-5	A-711
A102	SUPPORT, phenolic: 35-5/16 x 3/4 x 3/4 in. o/a.	4-5	A-713
A103	SUPPORT, phenolic: 4-1/2 x 5/8 x 1/2 in. o/a.	4-4, 4-5	PX-189
A104	SUPPORT, phenolic: 10 x 5-1/2 x 1/2 in. o/a.	4-6	PX-188
A105	SUPPORT, phenolic: 7-1/16 x 2-1/16 x 1/2 in. o/a.	4-6	PX-206
A106	SUPPORT, phenolic: 10 x 5-1/2 x 1/2 in. o/a.	4-6	PX-189
A107	SUPPORT, phenolic: 4-1/4 x 2-1/16 x 1/2 in. o/a.	4-5	PX-202
A108	SUPPORT, phenolic: 5-1/2 x 15/16 x 1/2 in. o/a.	4-5	PX-189
A109	SUPPORT, phenolic: 4-5/8 x 2-1/16 x 1/2 in. o/a.	4-5, 4-6	PX-201
A110	SUPPORT, phenolic: 7-1/16 x 2-1/16 x 1/2 in. o/a.	4-6	PX-201
A111	BRACKET, brass: silver plated; .032 x 1-15/32 x 3/4 x 2-7/16 in. o/a.	4-6	MS-469
A112	PLATE, teflon: 2 x 1-5/8 x 1/4 in. o/a.	4-5	PX-226
A113	PLATE, teflon: 2-15/16 x 1-5/8 x 1/4 in. o/a.	4-5	PX-227
A114	WASHER, teflon: 3/4 od x 7/32 id x 1/8 in. thick.	4-4	PX-224-2
A115	WASHER, teflon: 3/4 od x 7/32 id x 1/8 in. thick; flatted.	4-4	PX-224-1
A116	SPACER, brass: cadmium plated; 3 in. lg. x 5/16 in. diam.	4-5, 4-6	PM-376
A117	WASHER, teflon: 1/2 in. od x 13/64 id. x 1/8 in. thick.	4-5, 4-6	PX-222
C100 A,B	CAPACITOR, variable: air; two section; 42-258 mmfd; each section. .250 in air gap.	4-4	CB-115
C101	CAPACITOR, fixed: mica; .01 mfd, ±10%, 300 wvdc; char. B.	4-4	CM35B103K
C102	CAPACITOR, fixed: mica; .01 mfd, ±10%, 300 wvdc; char. B. Same as C101.	4-6	CM35B103K

SYM.	DESCRIPTION	FIGURE NO.	TMC DWG. OR PART NO.
C109	CAPACITOR, fixed: variable, 50 mmfd, 30 Kv peak; 65 amps max current.	4-6	CD-169-4
E180	THERMOCOUPLE, vertical mount: 2-5/8" o.d. x 1-1/2" wide overall.	4-6	MF-180-4
E181	THERMOCOUPLE, vertical mount: 2-5/8" o.d. x 1-1/2" wide overall.	4-3	MF-180-4
E102	INSULATOR, feed thru: female; white glazed steatite; 3/4 in. lg. o/a x 1-3/8 in. diam. tapered flange; 3/4 in. diam. x 5/16 in. deep well; 13/64 in. diam. hole.	4-3, 4-5	MS-188-1
E103	INSULATOR, feed thru: male; white glazed steatite; 1-1/2 in. lg. o/a x 1-1/8 in. diam. tapered flange; 3/4 in. diam. x 3/4 in. lg. insert; 13/64 in. diam. hole.	4-6	MS-188-2
E104	INSULATOR, ceramic: 3-3/4 x 3/8 x 3/8 in. o/a.	4-6	p/o CD-135
E105	INSULATOR, teflon: 1-23/32 x 15/32 x 1/4 in. o/a.	4-3, 4-5	PE-217
E106	CONTACT, brass: silver plated; 1/2 in. diam. x 1-1/8 in. o/a; 10-32 tpd.	4-3, 4-5	SM-225
E107	LUG, terminal: brass; hot tin dipped; 51/64 x 3/8 x .039 in. o/a; 1/4 in. id hole.	4-3	TE-232
E108	INSULATOR, teflon: 7-23/32 x 15/32 x 1/4 in. o/a.	4-3, 4-5	PE-215
E109	INSULATOR, teflon: 7-23/32 x 15/32 x 1/4 in. o/a.	4-3	PE-219
E110	LUG, terminal: copper; electro tinned 1 in. lg. x 1/4 id hole.	4-6	TE-241-4
E111	LUG, terminal: copper; electro tinned; 45/64 in. lg.; 5/16 in. id hole.	4-6	TE-241-2
E112	RAIL, shorting: brass; silver plated; 9-1/2 in. lg. x 3/4 in. diam.	4-4	MS-854
E113	PLATE, dial: aluminum; etched; 2-3/8 in. diam.; 0-50 scale.	4-3	LD-186
E114	ROD, brass: silver plated; 10-5/8 in. lg. x 3/16 in. diam. 10-32 x 3-1/2 in. lg. tpd each end.	4-5	PM-257
E115	LUG, terminal: copper; electro tinned; 45/64 in. lg; 5/32 in. id hole.	4-7	TE-241-1
E116	LUG, terminal: copper; electro tinned; 1-1/8 in. lg; 3/8 in. id hole.	4-4	TE-241-6

SYM.	DESCRIPTION	FIGURE NO.	TMC DWG. OR PART NO.
E117	ROD, threaded; brass; silver plated; 10-32 x 4 in. lg. w/formed nut at center.	4-6	A-185
E118	SHIELD, flexible: copper; tinned; 3/16 in. wd.	4-6, 4-7	WL-103-4
E119	INSULATOR, pillar: round; white glazed steatite; 3/4 in. lg. x 1/2 in. diam; tapped 8-32 x 1/4 in. deep each end.	4-3	MS90020
E120	INSULATOR, pillar; round; white glazed steatite; 1-1/4 in. lg. x 1/2 in. diam; tapped 8-32 x 3/8 in. deep each end.	4-3	MS90030
E121	STRAP, brass: silver plated; 2-7/32 x 5/8 x 1/32 in. o/a.	4-6	MS-502
E122	ROD, brass, nickel plated; 2-1/4 in. lg. x 1/8 in. diam.	4-6	PM-103
E123	LEAF, contact: nickel silver: 2-3/16 x 5/16 x .008 in. o/a.	4-9	MS-490
E124	LEAF, pressure: nickel silver; 1-9/16 x 3/8 x 7/16 in. o/a.	4-9	MS-492
E125	CLIP, electrical: phosphor bronze; silver plated; accomodates 3/4 in. diam.	4-3, 4-4	FH-102
E126	COLLAR, brass: silver plated; 5/8 in. diam. x 1/4 in. wd.	4-3	PM-251
E127	WHEEL, brass: silver plated; 1/4 in. id. x 1-1/8 in. o.d.	4-7	PM-252
E128	BUSHING, brass: silver plated; 1-1/4 in. diam. x 3/8 in. wd. w/ 3/8 in. diam hole.	4-7	PM-254
E129	POST, brass: cadmium plated; 1-5/8 in. lg. x 1/4 in. diam.	4-6	PM-273
E130	PLATE, brass: silver plated; 4-1/8 x 1-5/8 x .032 in. o/a.	----	MS-443
E131	STRAP, brass: silver plated; 6 x 7/8 x .032 in. o/a.	4-5	MS-452
E132	STRAP, brass: silver plated; 8-1/2 x 5/8 x .032 in. o/a.	4-5	MS-453
E133	LEAF, contact: nickel silver; 1-5/32 x 7/16 x 3014 in. o/a.	4-8	MS-483
E134	LEAF, pressure: nickel silver; 25/32 x 3/8 x 1/32 in. o/a.	4-8	MS-484
E135	INSULATOR, twin line; male; white glazed steatite; 7/8 in. lg. o/a x 3/8 in. diam. tapered flange; 1/4 in. diam. x 3/8 in. lg. insert; 3/16 in. diam. hole.	4-4	MS-152-1

SYM.	DESCRIPTION	FIGURE NO.	TMC DWG. OR PART NO.
E156	INSULATOR, feed thru: female; white glazed steatite; 1/2 in. lg. o/a x 7/8 in. diam. tapered flange; 1/2 in. diam. x 3/8 in. deep well; 3/16 in. diam. hole.	4-8	MS-153-2
E164	CLAMP, "U" type: nickel silver; 3/4 x 3/8 in. o/a; .025 thk.	4-4	MS-530
E165	CLAMP, "U" type: plastic; 7/8 x 1/2 in. o/a; 5/16 in. i.d.	4-3	CU-103-4
E166	COUNTER: C.C.W. rotation to incr.; 000-999.	4-2	PO-113
E169	CLAMP, "U" type: plastic; 11/16 x 1/2 in. o/a; .188 in. i.d.	4-5	CU-102-3
E184	PIN, roll: steel; 5/8 in. lg. x 1/16 in. diam.	4-7,4-5,4-8	PN-108-3
E185	NUT, wing: brass; nickel plated; 10-32 thd.	4-5, 4-6	NT-118-103269
E186	CLAMP, "U" type: plastic; 3/4 x 1/2 in. o/a; .375 in. i.d.	4-6	CU-103-6
E187	PIN, roll: steel; 15/16 in. lg. x 1/16 in. diam.	4-6	PN-108-4
E188	GASKET, outlet: cork; 15/16 in. o.d. x 1/2 in. i.d. x 1/16 in. thk.	4-4, 4-6	GA-116
E189	WASHER, spring: phosphor bronze; silver plated; 9/16 in. o.d. x 3/4 in. i.d. x .010 in. thk.	4-8, 4-9	WA-119
E110	CLIP, spring: double unit; brass nickel plated; 1-1/2 x 5/8 x 3/8 in. o/a.	4-5, 4-8	CU-302-3
E111	SPACER, stand off: brass; cadmium plated; 1/4 in. lg. x 1/4 in. diam.; 5/16 in. hole.	4-3	TE-117-1
E112	GASKET, cushion: cork; 1-5/16 in. o.d. x 3/4 in. i.d. x 3/32 in. thk.	4-3	GA-117
J100	CONNECTOR, receptacle: coaxial; female; VHF series; teflon insulation.	4-1	UG-290/U
L100	COIL, link: copper; silver plated; 4-1/2 in. lg. x 1/4 in. diam. o/a three 1/2 turn. p/o A-674.	4-3, 4-5	CL-136
L101	COIL, link: copper; silver plated; 3 in. i.d. x 3-1/2 in. o.d.; 5-1/4 turns. p/o A-678.	4-4	CL-135-2
L102, 103	COIL, sub-assembly: copper; silver plated; 3 in. i.d. x 3-1/2 in. o.d.; 34 turns. p/o A-677.	4-4	CL-134-1
L103	COIL, link: copper; silver plated; 4-1/2 in. lg. x 1/4 in. diam. o/a; three 1/2 turns; p/o A-674.	4-4	CL-136

SYM.	DESCRIPTION	FIGURE NO.	TMC DWG. OR PART NO.
L104	COIL, tank: copper; silver plated; 3 in. l.d. x 3-1/2 in. o.d.; 28-3/4 turns. p/o A-678.	4-4	CL-114-2
L105	PART of L102	4-4	
M100	METER, RF: 0-3 amps; molded case; 3-1/2 in. diam. x 2 in. o/a.	4-3, 4-4	MR-102-3
M101	METER, RF: 0-3 amps; molded case; 3-1/2 in. diam. x 2 in. o/a.	4-3, 4-4	MR-103-3
MP103	COUPLING, flexible: brass, steatite insulation 3-1/4 x 13/16 in. o/a; 1/4 in. hole.	4-3	MC-121
MP121	SPRING, contact: phosphor bronze, silver plated 1-1/2 x 1-3/8 x .025 in. o/a.	4-3, 4-5	MS-457
MP102	KNOB, instrument: skirt type; white indicator line 2-1/16 in. dia. x 7/8 in. deep o/c for 1/4 in. shaft.	4-3	MP-108-2
MP103	LOCK, dial: brass, nickel plated; 1-3/8 in. lg. x 3/8 in. dia. o/a.	4-3	PC-139
MP104	COUPLING, vernier: 5 to 1 reduction 2-9/16 x 1-49/64 in. o.a.	4-6	DC-139
MP105	KNOB, instrument type: black bakelite, 1 in. x 2 in. dia. o/a.	4-3	MP-125
MP106	HOLDER, spark gap: brass 3/8 in. lg. x 8-32 NC2 threads.	4-8	SM-128
MP107	STRIKE, case: steel 2-13/16 in. lg. x 13/16 in. wide.	4-5	PC-127
MP108	SHAFT, extension: brass 8-1/16 in. lg. x 1/4 in. dia.	4-3, 4-5	PM-278
MP109	SHAFT, extension: brass 5-1/16 in. lg. x 1/4 in. dia.	4-6	PM-279
MP110	SHAFT, double switch: brass; cadmium plated 8-1/4 in. long x 1/4 in. dia.	4-8	PM-275
MP111	SUPPORT, counter: aluminum 2-1/8 x 1/2 x .081 in. o/a.	4-3	MS-508
MP112	SUPPORT, coil center: phenolic, 2 in. OD x 1/2 in. thick o/a.	4-4	PX-107
MP113	SUPPORT, contact shaft: teflon; 3-6/16 x 3-11/16 x 1/4 in. o/a.	4-3, 4-6	PX-229
MP114	BRACKET, center support: aluminum, 1-15/16 x 1/2 x .081 in. o/a.	4-3	MS-459

SYM.	DESCRIPTION	FIGURE NO.	TMC DWG. OR PART NO.
MP135	BEARING, panel: brass; nickel plated 1/2 in. lg. x 3/8 in. dia. 1/4 in. ID hole.	4-5, 4-6	BB-101
MP136	COUPLING, flexible: non-insulated; brass 1-1/4 in. dia. x 23/32 in. thick o/a.	4-5, 4-6	MC-119
MP137	COUPLING, flexible: steatite; 9000 V peak flashover, 1-1/16 x 1-1/16 in. o/a.	4-5, 4-6	MC-118
MP138	BRACKET, thermocouple, aluminum 2-15/16 x 5/8 x .064 in. o/a.	4-5	MS-485
MP139	SHAFT, wheel: brass; silver plated, 5-1/4 x 1-13/16 x 1/4 in. dia. o/a.	4-7	PM-255
MP140	COUNTER SHAFT, brass, silver plated 9-1/8 in. lg. x 1/2 in. dia.	4-5	PM-256
MP141	ROD, switch connecting: brass 8-5/8 in. lg. x 1/4 in. dia.	4-6	PM-261
MP142	BUSHING, contact: teflon, 1/16 in. OD x 11/64 in ID x 11/32 in. wide.	4-3, 4-5	PX-223
MP143	BUSHING, connecting: phenolic, 1-5/16 x 1 x 3/8 in. ID o/a.	4-4	A-716
MP144	ROD, connecting: phenolic, 1-3/16 x 1/2 in. o/a.	4-7	PX-197
MP145	BEARING, panel: brass, nickel plated, 7/8 in. long x 3/8 -32 NCS threads x 1/4 in. ID hole.	4-5, 4-9	BM-124
MP146	SPRING, copper, 7/16 in. lg. x 3/8 in. OD.	4-7	SP-416-6
MP147	BASE, spark gap: brass, nickel plated, 1-3/16 in. lg. x 3/8 in. dia.	4-6	PM-277
MP148	RING, meter spacing: phenolic, 3-1/2 in. OD x 2-3/4 in. ID x 5/16 in. thick.	4-5	PX-236
MP149	BUSHING, connecting: brass; w/lockwasher and nut 11/16 in. lg. x 5/8-18 NCS threads x 7/8 in. hex head.	4-5	PM-247
MP150	BUSHING, switch: brass, 5/8 in. dia. x 5/16 in. thick.	4-5, 4-9	PM-258
MP151	BUSHING, capacitor support: teflon, 3/8 in. OD x 3/16 in. ID x 5/16 in. lg.	4-4	PX-229
MP152	STATOR PLATE, capacitor.	4-5	EX-100
MP153	ROTOR PLATE, capacitor.	4-5	EX-101
N100	TUNING CHART.	---	CH-124
P100	CONNECTOR, plug: coaxial; male; UHF series; teflon insulation, 1-5/16 in. lg. x 3/8 in. dia. o/a.	Loose Item	PL-259A

SYM.	DESCRIPTION	FIGURE NO.	TMC DWG. OR PART NO.
S100	SWITCH INDEX, 60 degree throw: steel 3-1/4 x 2-5/32 x 1-5/16 in. o/a, 1/4 in. flatted shaft.	4-3	SW-143
SW100	SWITCH, rotary: two sections; one pole; eight positions each section; steatite insulation.	4-3	SW-144
SW101	SWITCH, rotary: two sections; one pole; seven positions each section; steatite insulation.	4-3	SW-145
TL106	PUNCH, drive pin: steel, 4 in. lg. x 3/8 in. dia., tapered.	4-5	TP-106
TL101	WRENCH, hex: steel, 1-34/ in. lg. for #5,6 Allen head set screws.	4-5	WH-100-3
TL102	WRENCH, hex: steel, 2 in. lg. for #10, 12 Allen head set screws.	4-5	WH-100-5
TL103	WRENCH, hex: steel, 6 in. lg. for #6 Allen head set screws.	4-5	WH-100-10
Z100	DOUBLE LEAF SWITCH SUB ASSEMBLY: Consisting of: E111, E127, H304, MP110 and MP130.	4-4	A-867
Z101	CONTACT WHEEL AND SHAFT ASSEMBLY: Consisting of: E123, E126, H304, MP115, MP130, MP124, MP128 and Z118.	4-7	A-869
Z102	SINGLE LEAF SWITCH SUB ASSEMBLY: Consisting of: E124, E394, H304, MP123 and MP130.	4-8	A-866
Z103	SINGLE LEAF SWITCH ASSEMBLY: Consisting of: E108, MP125 and Z102.	4-6	A-872
Z104	DOUBLE LEAF SWITCH ASSEMBLY: Consisting of: E106, MP125 and Z100.	4-9	A-873
Z105	COIL ASSEMBLY: Consisting of: A100, A101, A105, A111, E105, E106, E108, E125, L100, MP112, MP126, Z106, Z107 and Z109.	4-3	A-874
Z106	TANK COIL SUB ASSEMBLY (clockwise)	4-3	A-875-877
Z107	TANK COIL SUB ASSEMBLY (counterclockwise)	4-3	A-876
Z108	NOT USED.		
Z109	LINK COIL SUB ASSEMBLY (counterclockwise)	4-3	A-878
Z110	SPARE ROD ASSEMBLY: Consisting of: E122 and E128.	4-6	A-868

SYM.	DESCRIPTION	FIGURE NO.	TMC DWG. OR PART NO.
Z111	EXTENSION SHAFT ASSEMBLY: coupling and band switch. Consisting of: MP128 and MP135.	4-3, 4-5	A-714
Z112	COUPLING SWITCH BRACKET SUB ASSEMBLY: Consisting of: A105, A117, R106 and MP133.	4-3	A-715
Z113	BAND SWITCH BRACKET SUB ASSEMBLY: Consisting of: A110, A117, MP133 and Z108.	4-3	A-722
Z114	COVER ASSEMBLY.	4-1	A-644
Z115	CHASSIS SUB ASSEMBLY.	4-2	A-645
Z116	GROUND STRAP ASSEMBLY: Consisting of: E131, E132 and E126.	4-3, 4-5	A-731
Z117	INPUT CONNECTOR ASSEMBLY: 8 in. lg. x 1-1/4 in. wide o/a.	4-3, 4-1	A-1353
Z118	GROUND LEAD ASSEMBLY: Consisting of: E115 and E116.	4-7	A-647
Z119	FUSEHOLDER STRAP ASSEMBLY: Consisting of: E120, E121 and E118.	4-6	A-731
Z120	FEED THRU CONNECTOR ASSEMBLY: 3-1/2 in. lg. x 1-3/8 in. wide o/a.	4-3	A-726
Z121	CONNECTOR ASSEMBLY: coil to coil, 5-1/2 in. lg. x 7/8 in. wide o/a.	4-3	A-732
Z122	OUTPUT CONNECTOR ASSEMBLY: 6 in. straight length, 2 in. radius.	4-3	A-733
Z123	CONDENSER STRAP ASSEMBLY: rear; 4-7/8 in. lg. x 1/2 in.	4-3	A-734
Z124	FEED THRU STRAP ASSEMBLY: 4-1/2 in. lg. x 1/2 in. wide o/a.	4-6	A-735
Z125	CONNECTOR ASSEMBLY: condenser to feed-thru; 2-3/8 in. lg. o/a.	4-3	A-736
Z126	CONNECTOR ASSEMBLY: thermocouple to wiper rod; 8-3/4 in. lg. o/a.	4-4	A-737
Z127	CONNECTOR ASSEMBLY: thermocouple to coil; 5-3/8 in. lg. o/a.	4-5	A-739-1

NOTE: IN CASES WHERE A PART IS USED SEVERAL TIMES THROUGHOUT THE UNIT IT IS ONLY LISTED ONCE.

ALL HARDWARE ARE STANDARD COMMERCIAL ITEMS EXCEPT AS LISTED.

ANTENNA TUNING UNIT

MODEL TAC

TUNING CHART

2000-5000 KCS

APPROXIMATE SETTINGS FOR RESISTIVE LOADS

BQ S	LOAD OHMS	BALANCED TUNE COND	BALANCED COUP TAP	BALANCED BAND SW TAP	BALANCED LOAD ADJ COUNT	UNBALANCED TUNE COND	UNBALANCED COUP TAP	UNBALANCED BAND SW TAP	UNBALANCED LOAD ADJ COUNTER
00	70	15	MAX	LO	162	8	MAX	LO	155
	300	17	MAX	LO	181	8	MAX	LO	190
104)	600	19	MAX	LO	189	8	MAX	LO	220
stal- d)	1200	20	MAX	LO	208	8	MAX	LO	260
00	70	17	MAX	LO	147	15	MAX	LO	155
	300	17	MAX	LO	164	16	MAX	LO	182
	600	17	MAX	LO	174	16	MAX	LO	182
	1200	18	MAX	LO	183	18	MAX	LO	211
00	70	32	MAX	LO	141	32	MAX	LO	150
	300	33	MAX	LO	159	32	MAX	LO	170
	600	34	MAX	LO	167	32	MAX	LO	177
	1200	35	MAX	LO	177	33	MAX	LO	190
00	70	43	MAX	LO	210	40	MAX	LO	138
	300	43	MAX	LO	160	40	MAX	LO	155
	600	43	MAX	LO	171	42	MAXQ	LO	172
	1200	35	MAX	LO	180	42	MAX	LO	172

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ANTENNA TUNING UNIT

MODEL TAC

TUNING CHART

2000-5000 KCS

APPROXIMATE SETTINGS FOR RESISTIVE LOADS

FREQ KCS	LOAD OHMS	BALANCED TUNE COND	BALANCED COUP TAP	BALANCED BAND SW TAP	BALANCED LOAD ADJ COUNT	UNBALANCED TUNE COND	UNBALANCED COUP TAP	UNBALANCED BAND SW TAP	UNBALANCED LOAD ADJ COUNTER
2000	70	15	MAX	LO	162	8	MAX	LO	155
	300	17	MAX	LO	181	8	MAX	LO	190
(C104) Instal-led)	600	19	MAX	LO	189	8	MAX	LO	220
	1200	20	MAX	LO	208	8	MAX	LO	260
2500	70	17	MAX	LO	147	15	MAX	LO	155
	300	17	MAX	LO	164	16	MAX	LO	182
	600	17	MAX	LO	174	16	MAX	LO	182
	1200	18	MAX	LO	183	16	MAX	LO	211
3000	70	32	MAX	LO	141	32	MAX	LO	150
	300	33	MAX	LO	159	32	MAX	LO	170
	600	34	MAX	LO	167	32	MAX	LO	177
	1200	35	MAX	LO	177	33	MAX	LO	190
3800	70	43	MAX	LO	210	40	MAX	LO	138
	300	43	MAX	LO	160	40	MAX	LO	155
	600	43	MAX	LO	171	42	MAXQ	LO	172
	1200	35	MAX	LO	180	42	MAX	LO	172

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FREQ KCS	LOAD OHMS	BALANCED				UNBALANCED			
		TUNE COND	COUP TAP	BAND SW TAP	LOAD ADJ COUNT	TUNE COND	COUP TAP	BAND SW TAP	LOAD ADJ COUNT
4000	70	9	2	2	122	8	MAX	2	128
	300	9	2	2	133	8	MAX	2	141
	600	18	2	2	137	8	MAX	2	150
	1300	10	2	2	143	10	2	2	168
4500	70	22	2	2	125	22	2	2	126
	300	22	2	2	131	22	2	2	142
	600	23	2	2	135	22	2	2	144
	1300	23	2	2	141	23	2	2	155
5000	70	32	2	2	129	32	2	2	139
	300	33	2	2	139	33	2	2	142
	600	34	2	2	147	34	2	2	150
	1300	35	2	2	150	34	2	2	152

ANTENNA TUNING UNIT

MODEL TAC

TUNING CHART

6000-12000 Kcs

APPROXIMATE SETTINGS FOR RESISTIVE LOADS

FREQ KCS	LOAD OHMS	BALANCED				UNBALANCED			
		TUNE COND	COUP TAP	BAND SW TAP	LOAD ADJ COUNT	TUNE COND	COUP TAP	BAND SW TAP	LOAD ADJ COUNT
6000	70	42	2	2	129	41	2	2	128
	300	43	2	2	131	42	2	2	139
	600	44	2	2	134	42	2	2	142
	1200	44	2	2	139	43	2	2	153
7000	70	18	2	3	132	15	2	3	128
	300	21	2	3	133	21	2	3	139
	600	27	2	3	135	22	2	3	137
	1200	31	2	3	141	24	2	3	142
8000	70	28	2	3	127	26	2	3	125
	300	37	2	3	131	30	2	3	138
	600	27	2	3	135	33	2	3	140
	1200	31	2	3	141	24	2	3	147
9000	70	28	3	3	131	40	3	3	127
	300	38	3	3	129	46	3	3	130
	600	43	3	3	130	46	3	3	133
	1200	44	3	3	134	50	3	3	132

FREQ KCS	LOAD OHMS	TUNE COND	COUP TAP	BAND SW TAP	LOAD ADJ COUNT	TUNE COND	COUP TAP	BAND SW TAP	LOAD ADJ COUNT
10000	70	41	3	3	121	40	3	3	136
	300	41	3	3	126	42	3	3	133
	600	42	3	3	127	44	3	3	132
	1200	44	3	3	129	34	3	3	135
11000	70	50	6	3	126	19	6	4	117
	300	24	6	4	119	21	6	4	125
	600	22	7	4	111	21	6	4	123
	1200	24	7	4	116	22	6	4	122
12000	70	26	6	4	122	26	6	4	120
	300	26	6	4	126	27	6	4	120
	600	32	6	4	123	26	6	4	120
	1200	36	6	4	123	30	6	4	121

ANTENNA TUNING UNIT

MODEL TAC

TUNING CHART

13000-19000 Kcs

APPROXIMATE SETTINGS FOR RESISTIVE LOADS

FREQ KCS	LOAD OHMS	TUNE COND	COMP TAP	BAND SW TAP	LOAD ADJ COUNT	UNBALANCED TUNING COND	UNBALANCED COMP. TAP	UNBALANCED BAND SW TAP	UNBALANCED LOAD ADJ COUNT
13000	70	14	6	4	124	25	4	4	130
	300	22	4	4	115	32	4	4	135
	600	34	4	4	113	42	7	4	120
	1200	24	4	4	114	43	7	4	118
16500	70	30	6	4	123	34	6	4	122
	300	40	6	4	120	38	6	4	122
	600	45	6	4	120	38	5	4	116
	1200	47	6	4	120	40	6	4	116
15000	70	36	6	4	120	40	4	4	120
	300	43	7	4	117	43	4	4	122
	600	47	7	4	115	45	4	4	120
	1200	50	7	4	114	45	4	4	117
18000	703	30	MIN	5	119	32	6	5	119
	300	41	MIN	5	112	34	6	5	116
	600	42	MIN	5	111	36	6	5	116
	1200	39	MIN	5	111	37	6	5	116

FREQ CPS	LOAD OHMS	TUNE COND	COUP TAP	BAND SW TAP	LOAD ADJ COUNT	TUNE COND	COUP TAP	BAND SW TAP	LOAD ADJ COUNT
7000	70	35	7	5	120	38	6	5	119
	300	41	MIN	5	114	39	6	5	119
	600	42	MIN	5	111	42	4	5	114
	1200	48	MIN	5	111	42	4	5	115
8500	70	40	7	5	118	43	5	5	120
	300	40	7	5	115	42	6	5	117
	600	39	7	5	115	44	6	5	118
	1200	45	7	5	115	50	6	5	114
9000	70	14	7	6	202	34	3	6	168
	300	10	7	6	199	24	6	6	178
	600	11	7	6	199	25	6	6	178
	1200	11	7	6	201	25	6	6	178

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TUNING CHART 20000-26000

FREQ IN	LOAD OHMS	BALANCED TUNING COND	BALANCED COMP TAP	BALANCED BAND SW TAP	BALANCED LOAD ADJ COUNT	UNBALANCED TUNE COND	UNBALANCED COMP TAP	UNBALANCED BAND SW TAP	UNBALANCED LOAD ADJ COUNT
1000	70	33	5	6	155	30	4	6	190
	300	14	7	6	178	29	4	6	174
	600	14	7	6	178	30	4	6	174
	1200	13	7	6	173	30	4	6	174
1000	70	26	7	6	202	31	6	6	192
	300	24	7	6	200	32	6	6	182
	600	25	7	6	200	33	6	6	180
	1200	25	7	6	194	33	6	6	179
1000	70	37	7	6	181	34	6	6	182
	300	20	7	6	180	35	5	6	176
	600	22	7	6	170	35	5	6	179
	1200	22	7	6	185	35	5	6	168
1000	70	30	7	6	198	36	7	6	185
	300	32	7	6	194	36	7	6	183
	600	33	7	6	186	36	7	6	182
	1200	30	7	6	186	36	7	6	182
000	70	30	7	6	180	39	7	6	184
	300	30	7	6	182	39	7	6	181
	600	30	7	6	182	40	7	6	180
	1200	30	7	6	182	40	7	6	180

MHz	LOAD OHMS	TUNE COND.	COUP TAP	BAND SW TAP	LOAD ADJ COUNT	TUNE COND	COUP TAP	BAND SW TAP	LOAD ADJ COUNT
400	70	35	7	6	188	13	7	6	197
	300	40	7	6	194	13	7	6	197
	600	40	7	6	194	13	7	6	197
	1200	40	7	6	194	13	7	6	191
60	70	35	7	6	197	20	6	6	150
	300	35	7	6	188	25	6	6	161
	600	35	7	6	188	25	6	6	151
	1200	35	7	6	188	13	6	6	160

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TUNING CHART
27000-30000 Kcs

Xtl	LOAD OHMS	BALANCED TUNE COND	COUP TAP	BAND SWITCH TAP	LOCAL ADJ COUNT	UNBALANCED TUNE COND	COUP TAP	BAND SW TAP	LOCAL ADJ COUNT
600	70	37	5	6	129	40	6	6	128
	300	42	6	6	124	47	6	6	132
	600	42	6	6	124	38	6	6	132
	1200	42	6	6	128	19	5	6	109
400	70	44	7	6	129	44	6	6	133
	300	44	7	6	129	50	6	6	132
	600	44	7	6	129	50	6	6	132
	1200	44	7	6	129	50	6	6	132
200	70	40	7	6	132	45	5	6	143
	300	40	7	6	132	50	5	6	132
	600	40	7	6	132	45	5	6	133
	1200	40	7	6	132	35	5	6	131
100	70	50	7	6	149	20	4	HI	130
	300	50	MIN	6	127	22	4	HI	130
	600	50	MIN	6	127	22	4	HI	130
	1200	50	MIN	6	127	15	4	HI	123

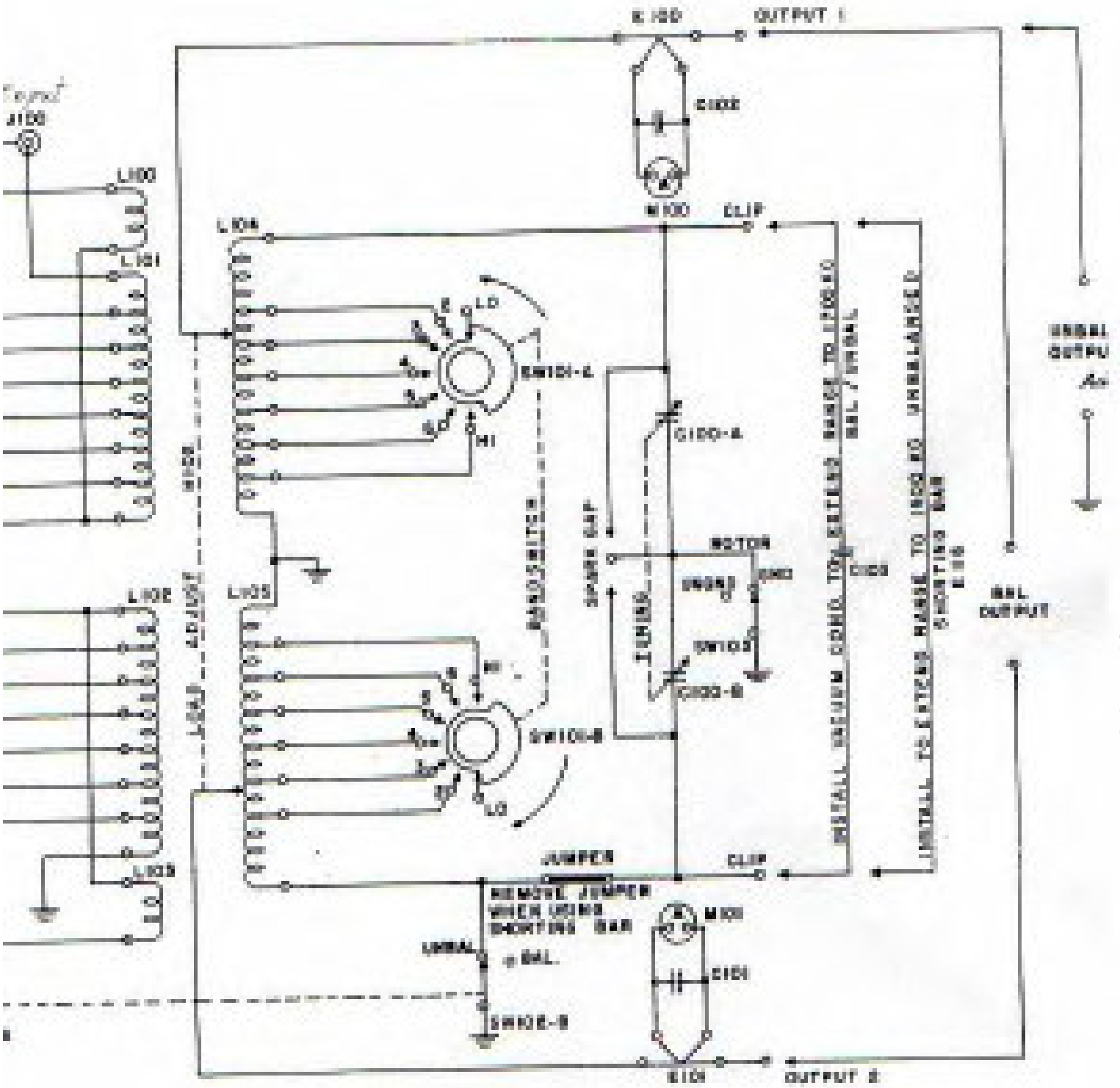

Figure 4-33. Schematic Diagram, Antenna Tuning Unit, Model TA